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ABSTRACT

This paper describes how the Input-Environment-Outcome (IEO) model of A. Astin can be used with the Cooperative Institutional Research Program (CIRP) Freshman Survey and the College Student Survey (CSS) to assess student change during college. The CIRP Freshman Survey, given to entering students, provides pretest data. The CSS, given to continuing or graduating students, provides posttest data, The IOE model provides the conceptual framework for organizing data and evaluating results. To demonstrate the use of these surveys, a study was conducted of the impact of community service participation on undergraduate student development. The CIRP provided the entering data (five consecutive administrations in 1990 through 1994) and the CSS provided followup data. The study was organized in line with the IEO model, which is designed to control for the nonrandom assignment of people (inputs) to programs (environments). The most remarkable finding of this study was that all 35 student outcomes were favorably influenced by service participation. These outcomes were grouped into areas of civic responsibility, academic development, and life skills. (SLD)

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Designing a Student Assessment Study: The CIRP Surveys and the Input-Environment-Outcome Model

HERI

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DESIGNING A STUDENT ASSESSMENT STUDY

THE CIRP SURVEYS AND THE INPUT-ENVIRONMENT-OUTCOME MODEL

"What can our assessment results tell us about how different educational policies and practices are likely to affect various educational outcomes? How much confidence can we have in the results?"

In *Assessment for Excellence*, Alexander Astin identifies two key questions that assessment studies should answer if they are to benefit colleges and students.

The value of assessment and evaluation lies in identifying factors that contribute to students' educational development. However, in order to assess students' educational (and other) development during college, we must know something about the students before they enrolled in college. We also must know something about the types of experiences these students had while in college. In other words, we cannot attribute development to a particular aspect of campus life without first controlling for students' incoming characteristics and experiences.

Astin's Input-Environment-Outcome (IEO) model is an approach to looking at cause and effect that takes into consideration what happens between the input and the outcome to more accurately determine causality.

Many assessment studies incorrectly focus on outcomes—measuring how many graduates earned advanced degrees, for example. However, this says little about the institution's educational impact or effectiveness in developing the talents and skills of students. After all, institutions vary greatly in the kinds of students that they enroll. By controlling entering student characteristics, you take into account the bias inherent in inputs. By controlling for the effects of other factors (such as college experiences) you can assess the actual impact of the variable of interest (such as a remedial program).

The IEO model is designed to yield assessment results that will simultaneously (A) yield maximum information on the possible causal connections between various educational practices and educational outcomes and (B) minimize the chances that our casual inferences will be wrong.

The IEO model provides a simple but powerful framework for the design of assessment procedures. Since educational practitioners must select from a wide array of activities in serving students, the IEO model can be used as an aid to educational decision-making by providing information on the likely impact of alternative courses of action.

This paper will describe how the IEO model can be used with the CIRP Freshman Survey and the College Student Survey (CSS) to assess student change during college. The CIRP Freshman Survey, which is given to entering students, provides pre-test data. The CSS, which is given to continuing or graduating students, provides post-test data. The IEO model provides the conceptual framework for organizing data and evaluating results.

The Cooperative Institutional Research Program (CIRP)

CIRP is a national longitudinal study of the American higher education system. Established in 1966 at the American Council on Education, the CIRP is now the nation's largest and oldest empirical study of higher education, involving data on some 1,800 institutions and over 10 million students.

The core of the CIRP is the annual survey of entering college students. The **Freshman Survey** covers a wide range of student

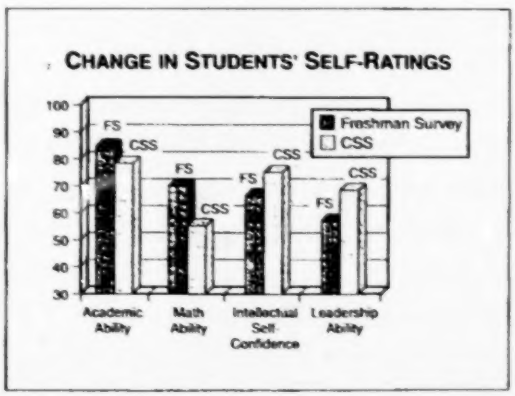

FIGURE 1

characteristics: parental income and education, ethnicity, and other demographic items; financial aid; secondary school achievement and activities; educational and career plans; and values, attitudes, beliefs and self-concept.

In 1993, the **College Student Survey (CSS)** was introduced to follow-up CIRP Freshman Survey respondents. The CSS provides information on a variety of student experiences while in college. The survey instrument covers: satisfaction with the college experience; student involvement; cognitive and affective development; student values, attitudes, and goals; and degree aspirations and career plans.

When "linked" with data from the CIRP Freshman Survey, the College Student Survey (CSS) provides information on how students have changed since entering college (FIGURE 1). As part of the IEO model, the surveys are useful tools for institutions' longitudinal assessment projects:

- To assess the effectiveness of a program or course;
- To evaluate the impact of student involvement activities;
- To study cognitive and affective growth while in college.

Astin's Input-Environment-Outcome Model

The IEO model is useful for both examining change over time, as well as examining possible causes of change.

The Input-Environment-Outcome (IEO) model was originally developed to produce results that will be of use to educational policy and practice. It can also be used to test and elaborate formal theories about human development within an educational, organizational, or social setting.

Many traditional institutional assessments focus on *outcomes*—that is, the measure of how many graduates earned advanced degrees or how much money the alumni earned. These measures do not aid in assessing the institution's effectiveness with its students. *Inputs*, then, refer to those personal qualities the student initially brings to the educational program at the time of entry. But what, specifically, is it about the college *environment* that facilitates student development? The purpose of the IEO design is to correct or adjust for *input* differences in order to get a less biased estimate of the comparative effects of different *environments* on *outcomes*.

To explain the IEO model with more familiar terminology, we could also refer to the *outcome* variables as dependent variables, criterion variables, posttests, outputs, consequences, ends or endogenous variables. *Environmental* and *input* variables are both types of independent variables, antecedent variables, or exogenous variables. *Inputs* could also be called control variables or pretests. *Environmental* variables might also be referred to as treatments, means, or educational experiences, practices, programs, or interventions.

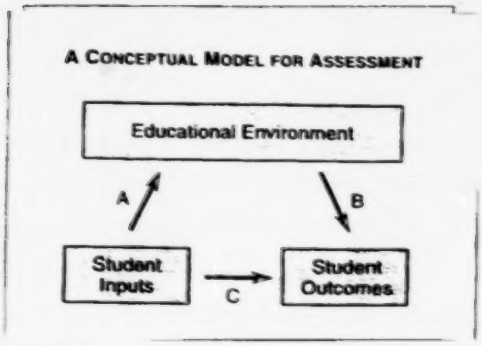

FIGURE 2

The three arrows in FIGURE 2, **A Conceptual Model for Assessment**, depict the relationship among three classes of variables. The relationship between environments and student outcomes cannot be understood without taking into account student inputs. Student inputs, of course, can be related to both outcomes (ARROW C) and environments (ARROW A). In other words, the differences among students tend to show some consistency (i.e., correlation) over time (ARROW C) and different types of students often choose different types of educational environments (ARROW B). The fact that inputs are thus related to both outcomes and environments means that inputs can, in turn, affect the observed relationship between the environment and outcomes.

To illustrate, suppose that we are concerned that many of our students do not seem to have very well-developed skills in English composition by the time they graduate. Accordingly, we administer a test of skill in English composition to all graduating seniors (outcome measure) and compare the average test performance of students who took different patterns of courses (different environments). We might well find, for example, that students who majored in engineering do relatively poorly on the test, whereas those who major in journalism do substantially better. Would such a finding justify the causal conclusion that majoring in engineering is detrimental to the development of talent in writing, and that majoring in journalism facilitates the development of writing talent? Probably not. Perhaps students who as freshmen choose to major in journalism already have better-developed writing skills when they first enter college (input) than do students who choose engineering. If so, we would expect journalism majors to score better than engineering majors on the senior test of writing skills, even if the different course-taking patterns had identical effects on the development of writing talent. The IEO model used in conjunction with a "pre-test" of writing skills could explain differences in outcomes more accurately than a simple causal inference. Engineering programs might then be encouraged to supplement the core

curriculum with writing courses—an example of how IEO might be applied to improve practice.

A study of the impact of service learning on undergraduate students

In 1995, The Higher Education Research Institute (HERI) used entering and follow-up data to study the impact of community service participation on undergraduate student development. The CIRP provided the entering data and follow-up data was obtained from the CSS. The study was organized in line with the IEO model.

Data used in this study were drawn from five consecutive administrations of the CIRP Freshman Survey (1990-1994) and through a follow-up survey, the 1995 CSS, which was sent to selected students from all five cohorts. The conceptual framework was the IEO model, which is designed to control for the non-random assignment of people (inputs) to programs (environments). In other words, to control for variables that may influence outcomes. Because some students (inputs) will be more inclined to participate in service (the environment) than will other students, the outcomes associated with this participation may not reflect the impact of service participation, but may simply represent differences in the characteristics of students who are likely to get involved in service. By controlling for the individual characteristics that lead students to become involved in service, we are better able to estimate the independent effects of participation.

METHODOLOGY

Inputs/Independent Variables: Input characteristics included freshman year pre-tests for each outcome variable; demographic variables (e.g., race and ethnicity, sex, etc.); and a set of service propensity variables from the freshman survey that were found to predict college service participation.

Environmental Variables: The analyses controlled for the student's major as well as the type of institution that might influence the student's likelihood of service participation. Most importantly, whether the student participated in service during college and the type of service (e.g., location, duration, etc.).

Outcome/Dependent Variables: 35 dependent variables (from the CSS) were classified into the following categories: civic responsibility (12 measures); educational attainment (10 measures); and life skills (13 measures).

SUMMARY

The most remarkable finding of this longitudinal study was that all 35 student outcome measures were favorably influenced by service participation. In other words, participation in volunteer service during the undergraduate years enhanced the student's academic development, civic responsibility, and life skills.

CIVIC RESPONSIBILITY

Perhaps the strongest evidence for positive effects of service participation on civic responsibility came from the items that were pretested when the students entered college as freshmen. For these items, data measuring differential change from freshman to follow-up became possible. As expected, people who later became service participants scored higher at the point of freshman entry on each of these seven items than did the future service nonparticipants, suggesting a certain amount of self-selection. Even so, the service participants also showed greater change between pretest and posttest than did the nonparticipants.

ACADEMIC DEVELOPMENT

The results of the longitudinal analyses revealed positive effects of service on all 10 academic outcomes. Each of the outcome measures was positively influenced by at least one type of student participation. Providing education-related service had positive effects ($p < .001$) on more academic outcomes (9 of the 10) than any other type of service had, and, with one exception, showed stronger effects than the other three types of service. More specifically, participation in education-related service enhances the student's college grade point average (GPA), general knowledge, knowledge of a field or discipline, and aspirations for advanced degrees, and is also associated with increased time devoted to homework and studying and increased contact with faculty.

LIFE SKILLS

All 13 life skills measures were significantly ($p < .001$) enhanced by participation in service activities during the undergraduate years.

Eight of the life skill outcomes showing significant effects of service participation come from the list of questions in the CSS in which students were asked to indicate how much they had changed since entering college. Perhaps more than any of the outcomes, these 8 were clearly consistent with the rationale most often given by advocates of volunteerism and service learning—that service participation enhances students' awareness and understanding of the world around them.

(Excerpted from Astin, A.W., and Sax, L.J. (1998). How Undergraduates Are Affected by Service Participation. *Journal of College Student Development, 39*, 3, 251-263.)

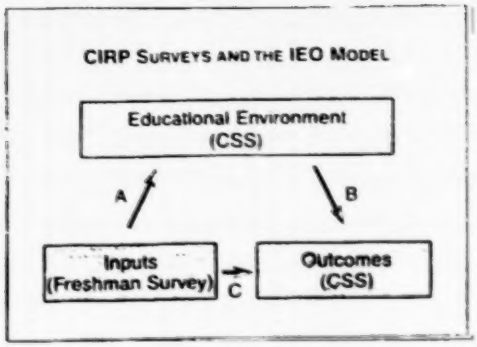

FIGURE 3

The CIRP Surveys

The College Student Survey can be used with the Freshman Survey to show how students have changed since entering college (FIGURE 3).

The CIRP Freshman Survey

Institutions are invited to participate in the CIRP Freshman Survey in March. The registration deadline is September 1st. The Freshman Survey instrument is available from mid-March through October. The survey should be administered in class during orientation or during registration (before the student has had experience with college).

The institution must collect and submit surveys for processing by October 15th. "Early" data files of the survey results are available by mid-November. The CIRP Institutional Profile is a detailed report profiling freshman responses, broken out by gender and compared with national norms for similar institutions. The institutional profile is delivered in late December. The following data services options are available to participating institutions in January:

- reports of results in electronic format;
- reports on specific subgroups of institutions;
- data files containing individual student responses;
- comparison reports for user-specified groups of institutions.

The College Student Survey (CSS)

Institutions are invited to participate in the College Student Survey (CSS) in October. The registration deadline is May 1st. The CSS survey instrument is available from early January through December. Administration of the CSS is divided into two six-month cycles. This allows institutions participating in the first cycle to receive results while the second cycle is still in the field.

If an institution intends to follow-up a particular CIRP cohort, it should identify the cohort year when it registers for the CSS. HERI will provide the institution with a data file containing the full names of students who participated in the CIRP (the cohort) and their social security numbers, if available. If possible, institutions should attempt to locate students who are not on campus (e.g., "drop-outs" or "stop-outs"). (The names in the data file can be merged with registrar's data for personalized cover letters.)

The survey can be administered in class or as a mail-out. The institution is responsible for distributing and collecting the surveys.

Results of surveys submitted by the first processing deadline[1] are available to institutions in mid-August. Two institutional reports are produced: the CSS Campus Profile Report and the CSS Follow-up Report. The campus profile contains the results of all respondents broken out by gender and compared to similar institutions. The follow-up report compares responses made on the CSS to responses students made on the Freshman Survey.

The following data services are available to participating institutions in September (after completion of CYCLE 1) and in March (after completion of CYCLE 2):

- reports of results in electronic format;
- reports on specific subgroups of institutions;
- data files containing individual student responses;
- comparison reports for user-specified groups of institutions.

[1] The first processing deadline is June 30th. Surveys will be accepted through December 31st. However, these results will not be available until February 15th.

For further information about the Input-Environment-Outcome (IEO) Model or the CIRP student surveys, contact:

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